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ABSTRACT

Defining videotex, viewdata, teletext, and their cognates as systems that transmit computerized pages of information for remote display (on a television screen, variously integrating computers, and video, broadcasting, telephone, typewriter, and related technologies), this report explores educational and related applications of videotex technologies in Great Britain. Topics discussed are: (1) the standard videotex terminology, (2) operating British videotex technologies (CEEFAX, ORACLE, and Prestel), (3) previous studies of videotex and education, (4) current videotex education projects in Great Britain (among them videotex as an informational listing of educational opportunities, multiple choice learning on Prestel, CEEFAX in classroom experiments, and the BBC's computer literacy project), and (5) videotex potential for education. (HOD)

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VIDEOTEX AND EDUCATION

A REVIEW OF BRITISH DEVELOPMENTS

By

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September, 1981

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Videotex, viewdata, teletext, and their cognates comprise a curious new technology, or rather a curious new combination of old technologies. These systems, which transmit computerised pages of information for remote display on a television screen, variously integrate computers, video, broadcasting, telephone, typewriter, and related technologies. By the end of the decade of the birth of these systems, the 1970s, at least 39 systems were being experimented with in 16 countries. The flagship of this fleet clearly flew the Union Jack: Teletext was initiated in Great Britain in 1972 and, while experiments have proliferated, the British Prestel system in early 1980 was still "the only non-experimental videotex system operating in the world."[1] Educators, standing on the deck of the flagship alongside bankers, travel agents, printers, advertisers, journalists, realtors, and many others, have cast wary eyes at Britain's experiments with videotex wondering what yet another new communication technology can do for them—and will do to them.

This report explores educational and related applications of videotex technologies in Great Britain. The findings are the result of several months in Britain spent visiting videotex education sites, interviewing planners and researchers, and reviewing reports. While videotex utilizations are still at an early state even in England, British experiments suggest preliminary lessons on capabilities and limitations of videotex for education and related non-commercial uses.

1. The Standard Videotex Terminology

In recent years the once erratic vocabulary of systems has achieved some standarization. The capabilities of systems varies drastically, from the restrictions of a narrowband one-way broadcast system to the possibilities of a wideband interactive system. Defined terms label each system and, in so doing, help to specify its range of capabilities.

1.1 "Videotex"

"Videotex" is now most accurately used as the generic term for all systems of transmitting information for remote video display. This use was recommended several years ago by the CCIT (Consultative Committee on International Telephone and Telegraph of the International Telecommunication Union) to replace the bewildering interchangeability which videotex, teletex, viewdata, and similar terms had acquired. Michael Tyler defines videotex as:

> systems for the widespread dissemination of textual and graphic information by wholly electronic means for display on low-cost terminals (often suitably equipped television receivers) under the selective control of the recipient, using control procedures easily understood by untrained users.[2]

There are five kinds of such all-electronic publishing systems under development at present:

(i) narrowband broadcast teletext;
(ii) narrowband interactive systems;
(iii) wideband broadcast or cabled teletext;
(iv) wideband two-way teletext; and
(v) hybrid systems.

The more common system labels tend to be used as follows.

1.2 "Teletext"

"Teletext" is a broadcast system which enables the home television to grab and display a page of information transmitted through the airwaves in the same manner as a television program. In fact, teletext transmits via an unused portion, or "vertical blanking interval," of a normal television channel. Several hundred pages are broadcast in a fast unbroken cycle which continuously repeats itself every twenty seconds or so. A specially modified television receiver set, on command from the user's remote key pad, grabs a page as it comes around in the cycle and displays it. There can be a delay of up to twenty seconds as the receiver waits for the page selected to come around in the cycle and be grabbed.

Teletext is inherently one-way communication, enabling the user to select information frames but not respond and interact. Tyler defines this narrowband broadcast teletext as a system "in which textual and graphic information is inserted into the redundant intervals in broadcast television signals, creating a stream of digitally coded frames of information from which the user can make his or her selection." [3]

1.3 "Viewdata"

"Viewdata" is a wired, rather than broadcast, system which expands upon what the more limited teletext systems can do. Viewdata systems make available (a) many times more pages of information, (b) without significant waiting time for pages, and (c) with limited user response and interactive capability. Videotex uses the telephone system or similar networks to distribute data in response to user requests. The user can interact with the information displayed on the video screen by selecting through buttons on the key pad to make purchases, reserve tickets, and other transactions. The cost of a specially modified television set or adaptor for viewdata is generally slightly higher than those modified for teletext and, unlike teletext, charges can be made for each use of the viewdata system.

1.4 "Wideband"

Wideband videotex systems can be either one-way or two-way. In either case, a full television channel is devoted to the service, rather than merely a few lines from a channel or a telephone line. A one-way broadband service, in the form of what might be called a broadcast or cabled teletext, can offer more pages more quickly than can narrowband

teletext, thus approaching the capability of a small viewdata system. But such one-way service cannot, of course, provide interaction. A two-way broadband service provides large data flows in both directions and, as a consequence, is the most utopian and most expensive variation of the videotex technologies. A hybrid of the above systems might provide telephone transmission upstream to select information frames and wideband transmission downstream to provide the frames.

1.5 "Telesoftware"

"Telesoftware" is not itself a technology but is rather a specific application of the above systems. Telesoftware refers to transmitting or "downloading" computer programs from a central facility onto remote terminals, using either broadcast teletext signals or wired viewdata transmission. Such computer programs are then available for off-line use in the user's own computer after disconnection from the videotex service. Because such telesoftware downloading can make permanently available a useful computer program by using only relatively few pages of videotex transmission, it is a practical application both within the limited page capacity of teletext and within the charge structure of viewdata which becomes expensive with prolonged transmissions.

2. The Operating British Videotex Technologies

In the United Kingdom over the past decade, one viewdata system, "Prestel," and two teletext systems, "CEEFAX" and "ORACLE", have moved from equipment development to field testing to large scale experimentation and finally to general service. While the end user experiences them in similar ways—reading pages on the television screen—the viewdata and teletext systems differ in significant ways.

2.1 "CEEFAX" and "ORACLE"

The two teletext systems operate in virtually identical manners. The Independent Broadcasting Authority operates ORACLE, which stands for Optical Recognition of Announcements by Coded Line Electronics, while the British Broadcasting Corporation operates the better known CEEFAX system, whose name is derived from See Facsimile. After a decade of experimentation, CEEFAX and ORACLE began full public service in 1976.

While ORACLE keeps its pages down to about 100 with quicker access time, CEEFAX offers more than two hours of reading every day on its more than 400 pages. A BBC team of twenty keeps the service updated from six in the morning until midnight every day. A teletext receiver costs approximately $200.00 more than an equivalent non-teletext television receiver. In the three years from mid-1978 to mid-1981, the number of teletext receivers in Great Britain increased from 5000 to 180,000. Continued rapid growth is anticipated. The BBC and IBA operate the teletext services free of charge to consumers. IBA includes about 15 pages of

advertising for income generation. The BBC supports CEEFAX from its institutional funds, garnered from such sources as the annual license fee (up to $90.00 per year) collected on each television set in Great Britain. A typical general index or "front page menu" for CEEFAX lists the following headings together with page numbers

NEWS HEADLINES 101

NEWS IN DETAIL 102-114

NEWSFLASH. 150

WEATHER. 115

FINANCIAL HEADLINES. 120

FT INDEX 125

SPORTS HEADLINES 130

TRAVEL NEWS. 116-119

CONSUMER NEWS. 141

PRICES GUIDE 142

RECIPE 143

FOR CHILDREN 144

FARMING. 147

2.2 "Prestel"

The British Post Office developed and operates "Prestel," the United Kingdom's viewdata service. Early development of what became Prestel coincided with the desire of the postal service, which also operates Britain's telephone service, to increase telephone revenues in off-peak hours. By the middle 1970s the service was in experimental use, and on September 11,1979, Prestel inaugurated full public service with about 1400 subscribers on line. In its first two years, Prestel's subscriptions increased to 12,000, a slower growth rate than anticipated. Despite an earlier promotional effort aimed at in-home consumers, only about 1500 Prestel subscribers are residential rather than institutional. Travel agents are the largest single cluster of subscribers, numbering more than 2000 by mid-1981. Education ranks about seventh among user groups in size, following transport, finance, engineering, business services, manufacturing, and distribution.

The two most frequently noted features of Prestel are its frame storage capacity and its price. Prestel has 250,000 frames available and more than 185,000 of those contained information as of July, 1981. That figure contrasts sharply with CEEFAX's 400 pages. This substantial library of pages was organized under the following general index or "menu."

GENERAL INTEREST INFORMATION

PRESTEL GAZETTE AND PRESENTING PRESTEL

BUSINESS PRESTEL

LOCAL INFORMATION

WHAT'S NEW ON PRESTEL

ALPHABETICAL LIST OF TOPICS

TOP TEN INFORMATION PROVIDERS AND
COMPLETE LISTING

YOUR BILL TO DATE

COMPLAINTS, COMPLIMENTS AND MAILBOX

There are three levels of charge possible on each use of Prestel, in addition to the cost of an adaptor. An adaptor or a special Prestel-capable television set costs approximately $300.00 additional, with that price dropping steadily over the years. After the initial investment, a user's television set is connected by a plug-in jack to the telephone line as well as an antenna. For each use of Prestel, the user must pay for a telephone call (local call charge for 60% of Great Britain currently) and then pay for computer time for as much as the transaction requires. In addition, certain pages of information also require a per frame charge usually of from two to ten cents. In this way the Post Office attempts to make Prestel self-supporting. The result, not surprisingly, is a strong skewing of Prestel toward commercial applications which promise return on costs. Education and social agencies, as well as individuals, understandably shy away from what can become an expensive transaction system.

On the other end of the system from the "users," approximately 150 "information providers" each place up to 250 frames of information in the system at a cost of approximately $7,500.00 per year and $7.50 per frame. The information provider can in turn charge a per frame fee which Prestel will collect and return. More than 400 additional "sub-information providers" place frames in the system through the umbrella service of main information providers.

2.3 Using the Services

Using a videotex system is considerably simpler than describing one. There is debate whether the operating systems are, in fact "user friendly" but all attempt to be. After a brief introduction, the user seeking information (videotex serves goal-oriented information seeking better than aimless browsing) should experience little confusion in operating the system. Up to a point, the usual experience is similar for Prestel, CEEFAX, or ORACLE.

The user begins by turning on the television set. He or she then sits with the "key pad" which "looks like a hand calculator and operates like a remote channel switcher," in the words of Paul Snider.[4] Pushing one of the function keys on the key pad switches the television from regular programming to the Prestel, CEEFAX, or ORACLE channel. A menu of contents appears and the user begins the path through the branching system to the desired information. From the general menu one selects a category such as "travel." From that category one selects a sub-category such as "air schedules," then region, then country, and finally specific flight schedules to and from a particular city.

At this point, the two systems separate. CEEFAX and ORACLE, as teletext systems, have gone as far as they can go. One than proceeds forward a page or back a page, or calls up a pre-selected page by its page number, or goes back to a general index, or switches off and leaves the system entirely, returning to watching television or to other activities. Prestel, however, offers further interactive capability. One may punch in a reservation on one of the flights identified, have it confirmed, and be billed for it. One may also book a room in a distant hotel, take a course in offset lithography, or look through theater reviews and book for a specific performance. When all transactions are completed, the user can check the costs of the activities and leave the system.

3. Previous Studies of Videotex and Education

Published research on videotex uses is not plentiful. The general literature about videotex technologies, plans, and hopes has expanded rapidly in recent years but controlled experiments on videotex applications are primarily in planning rather than reporting stages.

Of the general literature about videotex, one of the best is Michael Tyler's report on "Videotex, Prestel and Teletext: The Economics and Politics of Some Electronic Publishing Media."[5] Tyler describes the services and technologies, compares different national systems, identifies practical issues and experiences, explores the economics, and pinpoints major controversies over videotex policies and institutions. Work by Tyler, Hilary Thomas and others at Communication Studies and Planning,Ltd., explains and assesses videotex most usefully. John Tydeman and Lawrence Zwimpfer have contrasted the potential blessings and curses of videotex

in "Videotex in the United States—Toward Information Diversity."[6] In their scenario, choices being made now in videotex organization and uses can lead to cashless real-time participation in a new rural society of unlimited choice and information equality or can degenerate into poor electronic hermits getting poorer in an electronic Babel run by Dr. Strangelove and Big Brother. Certainly the implications of videotex are major, though they are only as decisive as Tydeman and Zwimpfer suggest if videotex is considered as a central subsystem of the larger general media system.

Demonstrations using videotex for educational purposes have been completed and a number of experiments are currently in progress or in planning but there is no systematic body of literature, and in fact virtually no scholarly literature at all, yet available on the subject. This is not surprising in view of the fact that the technologies are new and business or leisure, rather than education, has dominated the utilizations. Even where educational uses are being made of videotex, such projects have been understandably caught up in making the technology operative and putting together the human and institutional components, to the point where little hard data on learners and learning connected with videotex systems has been yet generated.

The progress of educational experiments in Britain has been reviewed periodically in articles in Viewdata and TV User, the monthly magazine of Prestel. Mike Aston, John S.S. Anderson, Israel Berkovitch, Peter Baker, and others have summarized there the progress of projects which they and others direct; their findings will be integrated in this report with other information on those same projects and related ones. The Montreal conference on "Videotex '81" brought together summary reviews of progress. Brian Champness in England, Peter Bowers, J. L. Campbell, and M. Gurstein in Canada, and John Tydeman and Lawrence Zwimpfer in the United States all reported on educational and social dimensions of current or planned videotex applications. James McDonnell, in a special issue of Communication Research Trends devoted to the subject of "The Telematics Society," reviewed writings on social and policy issues of videotex in a variety of national settings.[7] One can say about the educational role of videotex essentially the same point which Brian Champness makes about its social impact, "The absence of methodologically sound studies of videotex and teletext makes the business of predicting social impact notoriously difficult." At the same time, Champness maintains, " It is possible, however, to survey current social uses of these systems, and come to some tentative conclusions about future prospects." This report then attempts to survey some current educational uses of videotex and assess some future prospects.

4. Current Videotex Education Projects in Great Britain

"Viewdata, by fusing the power of the computer, the telephone and television provides us with the greatest opportunity to stimulate learning since the introduction of the printed word," states an introduction to an article in Prestel's Viewdata and TV User .[8] In the context of present

technology, such a statement is extremely misleading. A look at current applications illustrates the severe limits on the technology as a learning system.

4.1 Videotex as an Informational Listing of Educational Opportunities

The National Council for Educational Technology (CET) in London and the University Central Council on Admissions (UCCA) coordinate and provide educational advisory information in collaboration with other agencies and institutions over the Prestel system. For the person deliberating about college, Prestel offers such categories of information as: course guides, entrance requirements, grants, curricula and regulations, advisory services, and reading lists. CET in fact offers an "umbrella" service, which means that other educational agencies can input information into Prestel through CET. This has countered what CET labelled the "chicken and egg" dilemma: too few Prestel user sets in use and too few educational information providers feeding into the system. UCCA, CET, the National Institute of Adult Education, the Further Education Curriculum Unit, North East London Polytechnic, Aslib, and others are building up the information providers side. The user side of Prestel now includes more than 200 educational institutions or agencies, the fifth largest grouping of users, behind travel agents, investment, electronic engineering, and printing and publishing.

A critical mass developed over time is necessary in a videotex system to make services such as educational referrals practical. Even with years of experience, the British system is only now approaching such critical mass. "Blue sky" plans for such services in new systems starting from scratch elsewhere need to recall this issue. CEEFAX, because of its limited page size, is not practical as a source of such information. As a result, even here in the simplest information retrieval functions of the system, one finds a problem which recurs frequently: the "free" system (CEEFAX broadcast) has inadequate page capacity for this service, while the large system (Prestel wired) is expensive and much less widely available.

4.2 Multiple-Choice Learning on Prestel

On the Prestel system, the Caxton Publishing Company has put up an encyclopedia with associated quizzes and the Printing Industry Research Council (PIRA) has developed an employee training program. The learning method falls short of PLATO-style computer assisted learning but, by using the branching system, is partially interactive. The student does not have an alphanumeric keyboard on Prestel or CEEFAX. Responses can only be multiple choice through number selection. The user can be directed to separate branches depending on his answer but the system will not automatically take him there. A "reveal" function allows correct answers to be withheld and then revealed as the student responds. In one series of instructional questions, the Prestel frame charge is incurred only through wrong answers.

PIRA experimented with Prestel by modifying its book and slide series of instructions on offset lithography into a learning series on Prestel. An initial advantage of Prestel is that the learning series can constantly be updated with little difficulty. PIRA learners reported they liked the system and preferred it to learning from books; their scores went from 54 per cent before instruction to 95 per cent after the course. On the negative side, the PIRA test reported that some learners found it tiring, visual diagrams have to be rather crude affairs, response options are limited, and Prestel is expensive. On the last point, PIRA concluded that, "making reasonable assumptions about the numbers of companies who would be likely to use training material available in this way,...costs both for itself in preparing the material and for the companies using it would be much the same as for printed material."

4.3 CEEFAX in Classroom Experiments

In 1978-79 CEEFAX sets were placed in several dozen primary and secondary schools scattered throughout Great Britain and the Schools Broadcasting Council inserted special CEEFAX pages to supplement a secondary school television course "Exploring Science" and two primary school language courses, one broadcast on television and the other on radio. The resulting impressions were largely anecdotal but Peter Baker, monitoring schools in Leicester, observed the following:

-majority considered CEEFAX interaction "fun"
-children quickly mastered calling up pages
-no problems with vocabulary of "press Reveal",etc.
-news and current affairs knowledge greatly increased for some
-smaller groups better because of screen size
-picture fine tuning required monitoring
-page cycling (12½ seconds per page) was often too fast or too slow for given individuals
-video of text and simple diagrams seemed new but by no means fancy to students
-four-page text on CEEFAX per lesson severly restricted content and flexibility
-contributing quizzes, puzzles, and jokes of their own into CEEFAX excited students
-wide range of topics and constant updating of information useful for learning in variety of ways
-CEEFAX potential much greater if (a) instant random access to pages, (b) many more pages of information, and (c) true "interaction" of student with machine, students with other students, and schools with other schools.

In retrospect, the Leicester evaluator reports feeling now skeptical and believing the teletext technology may be "a bit over-rated honestly." [9]

Illustrative of the tentativeness of information available, John S. A. Anderson of the New University of Ulster conducted a projection study with

120 student teachers. The student teachers developed curriculum plans involving CEEFAX and ORACLE. News and weather pages proved most popular as illustrative materials for courses in science, meteorology, agriculture, and similar subjects. Primary school plans tended to have teachers accessing teletext and feeding information to students, whereas secondary school plans placed students in that role in such activities as selecting a menu from the Recipe pages and pricing the ingredients from the Commodity Price pages. Leisure pages appeared in plans for school leavers or pre-retirement groups and ORACLE book reviews were used in literature classes. Plans also called for information not now in CEEFAX or ORACLE in detail: on theaters, exhibitions, new books, on do-it-yourself home instructions, on careers education, and on teacher resources and continued learning. Not surprisingly, a large number of the curriculum plans called for a larger data-base than teletext provides, an ability to manipulate data and make responses, the opportunity to input content by the teacher, and public access to sets in libraries, work sites, and community centers.[10]

These two teletext "evaluations" highlight a frustration for other educators seeking to learn from the British experience: creative thinking and useful plans are evident but little hard testing has established the precise advantages and disadvantages of the many possible educational applications.

4.4. Prestel as an Educational Data Bank, Application Sorter, and Computer Interconnect

Viewdata systems offer greater educational potential than teletext systems because, as has been mentioned, they offer vastly increased data storage capacity, instant random access to pages, and increased user interaction with the system. As a consequence, despite British viewdata's (Prestel) expensiveness and smaller distribution among the population, the Council on Educational Technology has been experimenting with indexing Prestel data around educational topics, implementing electronic higher educational admission procedures, interconnecting Prestel with other computers, and providing computer programs to schools via telesoftware.

Educational Index. Prestel does not list "education" as a main category, partially because of Prestel's orientation to business and to becoming economically self-supporting. British schools are not a lucrative market since they have been experiencing budget reductions for almost half a decade and anticipate more reductions. Instead, the primary index headings, or "menu," for Prestel concerns business, local information, etc.

However, Mike Aston of the Hatfield Advisory Unit for Computer Based Education reported in 1979 that 20 per cent of the then Prestel information providers were concerned with education in one form or another and that 6.7 per cent of the total frame access was to material which could be described as educational. Educators were often not able to find relevant

material, however. For example, TWA's Prestel list of American cities to which the airline flies might enliven a geography class, but not if the instructor has no idea the information is there.

Responding to this problem, the Council for Educational Technology has created an educational re-indexing of Prestel information. The user may go to headings from Art to Zoology and be led to relevant information put into Prestel for a variety of purposes but useful in education.

College Admissions. Each year the higher education system transmits more than three million pieces of mail in processing student admissions to colleges and universities. CET is experimenting with ways of carrying out that process over Prestel.

Connecting with Other Computers. Prestel's new "Gateway" project interconnects computers. Prestel users always interact with the Prestel computers in connecting, selecting frames, and being charged. Now, CET and Prestel are exploring ways for a Prestel user to connect into other computers through Prestel and gain access to additional data-bases and programs. The project, called "Gateway," not only will provide researchers and teachers and students access to new resources, it will also offer a billing mechanism for such interconnects through Prestel's automated charging structures.

4.5 Telesoftware as a Videotex Application for Education.

Three different institutions are especially prominent in British experimentation with telesoftware, one in Hatfield, one in Brighton, and the CET in London. These telesoftware uses of videotex may prove in the long run the most important educational applications of the broadcast of wired systems. England has in the past year committed itself to having a microprocessor in each of its 6,500 secondary schools. These will be the 380 ZED or Acorn's new Proton microcomputer. The instant availability of correctly recorded programs on cartridge or disc for these microprocessors will be important. Both viewdata and teletext may be crucial for this purpose.

(A). Hatfield. The Hertfordshire County Council and its Advisory Unit for Computer Based Education (AUCBE) have been involved with Prestel since 1976. The County and its sub-units have their own Prestel channel with pages on all aspects of local life, from school details to tourist attractions. This Hertfordshire system is somewhat similar to the much larger Birmingham local Prestel system. The AUCBE carries on a variety of activities, including providing pages for the County Prestel channel and assisting in local utilization of Prestel by schools. The AUCBE also plays an important role in the two CET projects and the Brighton project described below.

(B). Council for Educational Technology. The CET evaluates educational audio-visual equipment and programs for schools, experiments with open learning systems, studies computer assisted learning, convenes educator groups, and conducts a number of activities which make it a natural location for specialized

explorations of educational videotex to appear. Since 1978, CET has worked with Prestel in various capacities. CET now conducts two major projects involving Prestel.

(1) The "Educational Trial of Prestel" is being conducted by CET by placing Prestel terminals in 32 educational institutions throughout the United Kingdom. The aim is to advise education and training services of the educational potential of Prestel as a teaching/learning resource and to improve the suitability of Prestel for such education. The trial will also give students experience in using a simple on-line computerized information system.

(2) The "Educational Telesoftware Project" more specifically uses Prestel as a common carrier for Computer Aided Learning software and data. The first accomplishment of this project is the publication of "Format Recommendations for Prestel Telesoftware," which establishes standards for the transmission and reception of computer programs via Prestel. The document draws on recommendations from micro-processor manufacturers, educational users, and other interested agencies. Telesoftware enables "intelligent" systems to communicate with one another: a properly formatted and connected microcomputer can select an entire computer program from the Prestel system, download the program, and run it or store it off-line. The CET project also enables users to download part of the Prestel database and manipulate that database on their microcomputer. This year the CET project is making some 20 computer programs available to 6 schools with additional schools planned. The programs cover geography, physics, mathematics, language-learning, and other subjects.

(C) Brighton. The "Telesoftware for Education Project" at Brighton Polytechnic resembles the CET project except that it uses broadcast teletext, both CEEFAX and ORACLE, to transmit or download its computer programs. Experimental telesoftware receivers were designed and supplied at a nominal cost by Mullard Limited, a Phillips subsidiary. Nine secondary schools throughout the United Kingdom have been supplied with these receivers and can utilize educational computer programs broadcast by CEEFAX and ORACLE. The Brighton project is especially concerned with classroom utilizations and not merely distribution systems. The intention is to work with skilled teachers who will adapt programs to their own classroom needs and provide direct corrective feedback to the originators of the computer programs and the project. Arts and humanities teachers are of special concern because of past computer bias in favor of math and science. A goal is to make the telesoftware simple to use and multi-disciplinary in order to maximize use and, in so doing, reduce its relative cost. The Brighton project team is concerned with more than in-school use. They look foward to when telesoftware can offer extra services like working out mortgage payments or income tax and can help shift the focus of learning away from schools, somewhat as the Open University has done.

At a more immediate level, the Brighton project has the tasks of (1) proving the technology in terms of developing capturing routines, storage space, etc., within the broadcast teletext framework, and (2) encouraging diverse software writing and program implementation. No one appears yet to be attempting to answer empirically the complex comparative question of the relative costs and benefits of viewdata versus teletext in regard to telesoftware or other uses.

4.6 The BBC's "Computer Literacy" Project.

Many of the above issues are being inter-related in the major new BBC Computer Literacy Project. The aim of the project is to introduce the world of computers and computing and to enable viewers to learn through direct experience how to program and use a micro-computer. The project is built around a ten-part television series and is related to three shorter program series the BBC is producing on microelectronics. The ten-part series explains and illustrates fundamentals of computing on both theoretical and practical levels. Offered in conjunction with the series are a course text or "handbook," a 30-hour National Extension College course and, most interestingly, an entire microcomputer system with optional add-ons.

The BBC selected Acorn to produce a microcomputer to market in conjunction with the series, a commercial collaboration which raised some eyebrows in the British press. The BBC wrote of the unit, "No bigger than a typewriter, the machine in its simplest version (price £235) can use an ordinary domestic TV set (color or black and white) as its display screen, and simple audio cassette recorder to load and store programs." Optional add-ons include a range of second processors to provide extra memory, disc systems to provide more flexible storage capacity, linkage to printers, and a teletext receiver which can also be extended to receive Prestel. (The total system cost is well over $2000.) The scope and visibility of the project may make it a useful point of convergence for the complexity of computer languages and program formats described above.

4.7 Related Experimentation: Libraries, Consumers, Open University.

Library experimentation with Prestel carries obvious educational implications. A project exploring "Prestel in Public Libraries" was developed by the British Library and ASLIB. Six central libraries and seven branch libraries placedPrestel sets in their reference sections and added substantial files of local information on housing, nurseries, county councils, and similar local matters. Overall they found a slow steady increase in use over time; novelty use peaked in 3 to 5 months; the projects ran for 12 months. The demographics of users are significant. School children used the system a great deal and were enthusiastic; adult usage was mainly business oriented. Males used the

system more than females. Higher socio-economic levels seemed apparent among users. These demographics are not inconsistent with general reference section usage, but especially in the Prestel experiment, "Older poorer women came out rather badly," as one researcher put it.11 Library staff orientation to the Prestel system was more difficult than student usage.

The National Consumer Council has attempted to represent the interests of the general public in Prestel, a healthy antidote to Prestel's perhaps economically necessary drift toward business uses. The National Consumer Council publishes a booklet titled "Let Prestel Solve Your Everyday Problems." The booklet lists page groupings of information on education, employment, health and safety, advice-giving organizations, welfare benefits, and consumer protection. The Council has played an active role in convening a "Social Information Providers Committee" for Prestel motivated by considerations that (a) there should be social and public information on the system and (b) public interest concerns will have more influence on development of the system working from the inside. The Council is initiating an 18 month project to place Prestel terminals in existing information points in 3 towns, attach printers to them, build up a local data bank, and monitor public usage of such services. This Prestel "Guided Public Access Project" may have major implications for appreciating a larger role for viewdata systems.

The Open University has obvious interest in educational uses of videotex. The Open University teaches 78,000 students scattered throughout England and does so via media and tutorials. The desire to provide computer-assisted learning at convenient locations for students, ideally in fact in the home, spurs the Open University's interest. A substantial portion of Open University effort in this area has gone into creating a more complete, flexible, and subtle viewdata system for the University's own needs than can be supplied by Prestel. They have developed an Optel operation but also have designed a new viewdata system called CYCLOPS. These technical advances in system design and capability may pay significant educational benefits, although the proof of such may be several years away.

All of the above described videotext education projects in Great Britain contain numerous lessons for future applications. Unfortunately, for those of us looking for clear, quick, finished directives based on empirical evidence, the most important proven conclusions are yet to come. It may be helpful, in lieu of more targeted or grandiose recommendations, to conclude this report with a series of relatively obvious but important summary observations.

5. Videotex Potential for Education: Summary Observations

As in the case of virtually any new technology, videotex capabilities suggest innumerable exciting possibilities for educational applications. Yet for educational decision-makers, constraints of budget, competition for resources, technical complexities, and disillusionment with results of previous innovative technologies breeds a conditioned cynicism toward new technologies such as videotex. What general factors play the largest role in planning and utilization of videotex for education?

Four factors are relatively obvious in British uses of videotex for education. In fact, these same factors constrain also videotex applications to Electronic Fund Transfer, travel services, entertainment, and all other areas. Discretionary capital available to finance technological innovations is not available to educators in amounts comparable to that found in parts of the private sector, and return on such investments is much more difficult to measure in education than in activities where monetary return is the measure. As a consequence, the four factors require particular understanding from educators.

(i) Technical capabilities of each specific videotex system facilitates certain applications and prohibits others. Frame storage capacity, speed of response, graphic resolution, access availability and interactive features vary from system to system in the extreme. A large scale utilization reaching many users will generally use teletext because of its greater availability. This means very few frames can be employed, a slower response time, and little user interactive control. This was the case with the 1979 elementary school experiment which employed CEEFAX and ORACLE.

(ii) Economic costs of each system facilitates or prohibits certain applications. Services which require improved storage capacity, speed, and interaction involve increased costs and will generally aim at more specialized target populations. An application which calls for many pages of information and frequent user interaction with the system will operate most effectively with a viewdata system. Such uses are significantly more expensive per participant than the teletext uses. The PIRA training program in offset lithography proved effective but may be beyond the budget of most public education.

(iii) Databanks already maintained in videotex systems are available for educational uses whether with or without further manipulation of their contents. (a) Data can be entered for this purpose as is the CET Educational Index. (b) Further, a viewdata system like Prestel contains hundreds of pages of continually updated information on current events, weather, markets, or other subjects. Such data supplements textbook or

lecture information and can enliven student exercises. Ulster course proposals draw heavily on this capability. (c) Data can also be electronically manipulated by the endline user through computer programs which, in essence, reach into the videotex system to extract and recombine data. The Brighton project implements this capability.

(iv) Transmission channels of a videotex system are available without regard to previous content of the system. This capability applies especially to downloading computer programs and interconnecting computers. "Intelligent" terminals can be introduced into the videotex system, and off-line storage can be utilized. (a) The Hatfield and CET projects download programs via Prestel while the Brighton projects does the same via CEEFAX. Of course (in light of item ii, above), educational users are restricted by the costs incurred by Prestel's billing structure or by the cost of special units necessary to receive computer programs transmitted by CEEFAX. (b) The Gateway project allows entry into other computers via the Prestel system. A user may go "through a page" in Prestel to be interconnected to an outside computer other than the Prestel main data bank computer. In this manner, as was pioneered at the Open University, a viewdata (but not a teletext) system becomes a time-shared computer facility.

Great Britain has pioneered the implementation of videotex. While initial research and development was heavily subsidized, the systems are directed toward becoming self-supporting without artificial subsidies. Within that context, educational uses of videotex in Britain vary from moderately ambitious to self-consciously cautious. The initiative of videotex, like the technology, is shifting to many countries and diverse applications. What does the future hold?

Who will videotex best serve and which of its parent technologies will it most closely imitate? Will it facilitate interpersonal interaction like the telephone, or increase data manipulation like the computer, or entertain vast audiences like broadcasting? Or will it develop a unique identity? Will videotex be a richly varied technology, pluralistic in organization, and serving the interests of all segments of society? Or will it prove monopolistic, concentrating social power in small elites and manipulating those it claims to serve? Opinions proliferate on these and many other questions concerned with videotex. Neither the British nor anyone else can yet answer them with certainty. Educators may play a decisive role in determining the future and implications of videotex. The current situation brings to mind Edward R. Murrow's warning about television uttered a quarter of a century ago:

> This instrument can teach, it can illuminate, yes, and it can even inspire. But it can do so only to the extent that humans are determined to use it to those ends. Otherwise it is merely lights and wires in a box. [12]

Notes

[1]Hilary B. Thomas, "Prestel: the British Experience and Beyond," paper presented to the Teleconferencing and Interactive Media Conference, Madison, Wisconsin, May, 1980.

[2]Michael Tyler, "Electronic Publishing: A Sketch of the European Experience," paper presented at Teletext and Viewdata in the U.S.: A Workshop on Emerging Issues, Institute for the Future, Menlo Park, California, June, 1979.

[3]Michael Tyler, "Videotex, Prestel and Teletext: The Economics and Politics of Some Electronic Publishing Media," Telecommunications Policy, March, 1979, 38.

[4]Paul Snider, "Great Britain's Videotex Permits TV Viewers Picture or Text Option," Journalism Quarterly 58 (Summer, 1981): 187.

[5]Tyler, "Videotex."

[6]John Tydeman and Laurence Zwimpfer, "Videotex in the United States—Toward Information Diversity," paper presented at Videotex '81, Toronto, May, 1981.

[7]Communication Research Trends, (Centre for the Study of Communication and Culture) 2 (Spring, 1981).

[8]Viewdata and TV User, 1 (July, 1979): 33.

[9]Peter Baker, interview, Leicester, July, 1981. See also his article, "Teletext in Education: First Impressions," Viewdata and TV User, 1 (April, 1979): 30-31.

[10]John S.A. Anderson, "Future of Viewdata and Teletext in the Classroom," Viewdata and TV User, 1 (October, 1979), 41-43.

[11]Cathy Sullivan, interview, London, August, 1981.

[12]Quoted in Fred W. Friendly, Due to Circumstances Beyond Our Control (New York: Vintage Books, 1968), vii.

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